THREE INTERESTING NEW HYPHOMYCETES FROM SOUTH EAST ASIA

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ABSTRACT - This paper deals with the description and taxonomy of three interesting new dematiaceous hyphomycetes from southeast Asia, and is part of the author's continuing work on tropical microfungi. Of these, *Dwibeeja sundara* gen. et sp. nov., occurring on a variety of substrates and collected in Singapore, is unique in producing robust, dark-opaque synnemata with many simple conidiogenous cells and acrogenous chains of twin one-celled, brown conidia, the first one in the chain gangliar and the second one blastic. The two other hyphomycetes were both collected on *Smilax* sp. from Malaysia and are unique in producing solitary, gangliar, euseptate conidia, each with a characteristic cap, acrogenously on simple conidiophores and their successive, percurrent lageniform proliferations. Both conidiogenesis and morphology of the conidium appear to be unique in these fungi. These two fungi are clearly congeneric and are accomodated in a new genus, *Javonarxia*, as two new species, *J. triseptata* (Type species) and *J. quadriseptata*: the conidia of the former are 3-septate, of the latter 4-septate.

RÉSUMÉ - Description et taxonomie de 3 nouveaux Hyphomycètes dématiés récoltés dans le Sud Est asiatique.

Le premier, *Dwibeeja sundara* gen. sp. nov., rencontré sur plusieurs substrats et récolté à Singapour, produit des synnemas sombres avec de nombreuses cellules conidiogènes et des chaînes acrogènes de conidies unicellulaires jumelles, brunes, la première étant une ganghospore et la seconde une blastospore.

Les deux autres ont été récoltées sur *Smilax* en Malaisie et sont originaux par la production de gangliospores solitaires cloisonnées avec une coiffe caractéristique, acrogène sur des conidiophores simples à proliférations percurrentes successives, lagéniformes. La conidiogenèse et la morphologie des conidies sont particulières et autorisent à regrouper ces champignons dans un genre nouveau: *Javonarxia* avec deux espèces: *J. triseptata* (espèce type) à conidies triseptées et *J. quadriseptata* à conidies quadriseptées.

KEY WORDS : Hyphomycetes, *Dwibeeja*, *Javonarxia*, southeast Asia.

During the period of the author's stay in Singapore as Visiting Professor in the National University of Singapore during 1986-87, the author made numerous collections of microfungi from Singapore, and some collections from Malaysia and Indonesia. These southeast Asian collections include several interesting or new taxa and the study of these forms part of the author's continuing work on tropical microfungi. In this paper three interesting new hyphomycetes are described and their taxonomy is discussed.

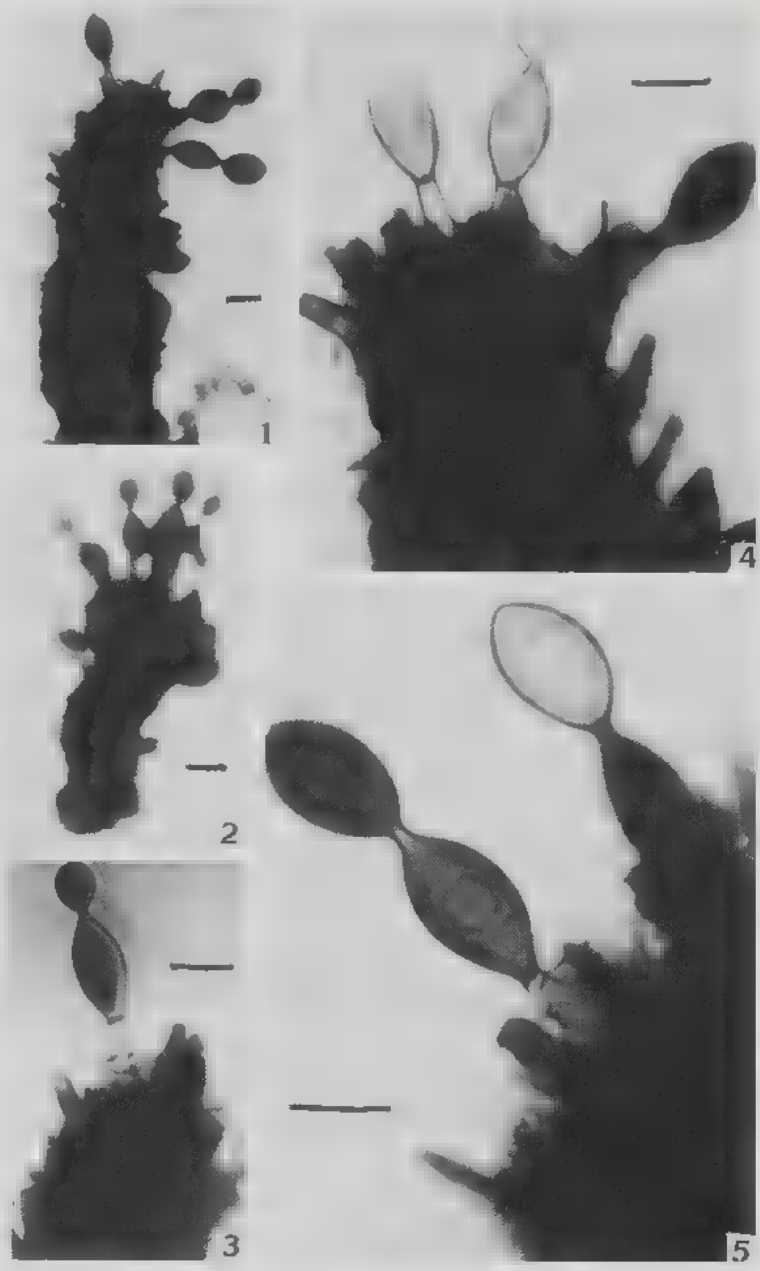

Fig. 1-5: *Dwibveja sundara*. 1, 2: synnemata (? stroma) with projecting conidiogenous cells and chains of twin conidia. 3: a conidiogenous cell with the first formed gangliar conidium and second conidium developing blastically from the tip of the first conidium. 4-5: conidiogenous cells and chains of twin conidia in various stages of development. Note guttules within conidia in fig. 5. Fig. 1-4: ex Type specimen, S57; Fig. 5: ex S 24. Bar connotes 10μm.

1. *DWIBEEJA SUNDARA* gen et sp. nov.

This interesting hyphomycete was collected on dead bark of *Calophyllum inophyllum* and other substrates from Singapore and is described below.

The fungus is easily recognizable by the numerous, or often not so numerous, or even sparse, synnemata that are mostly scattered or sometimes gregarious on the substrate. The synnemata are stout, thick, dark-opaque, fertile along the length (all around) and at the apex, up to 250 μm tall, and 28-40 (64)μm wide (Fig. 1-2). The conidiogenous cells which project from the body of the synnema all along, and around the tip, are simple, short, brown, up to 20μm long, 2-5μm wide at the tip and 3-7μm wide at the base (Fig. 3). The conidia are borne typically in simple acropetal chains of two conidia on each conidiogenous cell acrogenously, one-celled, coffee-brown in colour, thick-walled, smooth and dry (Fig. 4-5). The first (i.e. primary) conidium is gangliar, acrogenous, broadly fusiform, narrowed to a somewhat mamillate part at each end, and 14-21 x 6-11 μm. The second (i.e. secondary) conidium is produced blastically from the tip of the first (gangliar) conidium and is ovoid, invariably shorter than the first conidium, slightly narrowed to a mamillate tip, narrowed at the base where it is attached to the first conidium, and 10-15 X 7-9μm. The conidia are often detached with part of the conidiogenous cell, and may remain in pairs or fall apart. Young conidia are paler in colour than the older ones and often show a guttule or two within.

The occurrence of chains of twin conidia with the primary conidium gangliar in origin, and the second blastic, recalls the situation in the genus *Padixonia* Subram. as typified by *P. bispora* Subram. (Subramanian, 1972). Dixon (1985) has shown that the primary conidium is holoblastic, but the second one in the chain is enteroblastic. The tandem pair of conidia secedes as a unit. However, the present fungus is quite distinct in forming conspicuous synnemata. Also, the conidiogenous cells are simple, short and tubular, unlike those of *Padixonia*. Chains of twin conidia are also found typically in *Beejadwaya bispora* (Matsushima) Subram. (Subramanian, 1977), but here both conidia are blastic and there are, of course, no synnemata. Since there is apparently no suitable genus in which the present fungus can be accommodated, a new genus, *Dwibeeja* is proposed here for it. The generic name is from Sanskrit: *dwi* = two, *beeja* = seed, spore, from the pairs of conidia that are typical. The specific epithet is also from Sanskrit: *sundara* = beautiful.

***DWIBEEJA* Subramanian anamorph gen. nov.**

Dematiaceous hyphomycete. Synnemata simple, fertile all over the surface. Conidiogenous cells simple, short, cylindrical to subcylindrical, brown. Conidia acrogenous, in acropetal chains of two each, brown, one-celled, dry. First conidium gangliar, second conidium blastic.

Fig. 1-5: *Dwibeeja sundara*. 1, 2: synnema avec cellules conidiogènes orientées vers l'extérieur et chaînes de conidies jumelles. 3: cellule conidiogène avec une première ganglioconidie et une seconde qui se développe de façon blastique au sommet de la première. 4-5: cellules conidiogènes et chaînes de conidies jumelles à divers stades de développement. En 5 on notera les guttules à l'intérieur de la conidie. Fig. 1-4: espèce type S57; Fig. 5 ex S24. Echelle = 10μm.

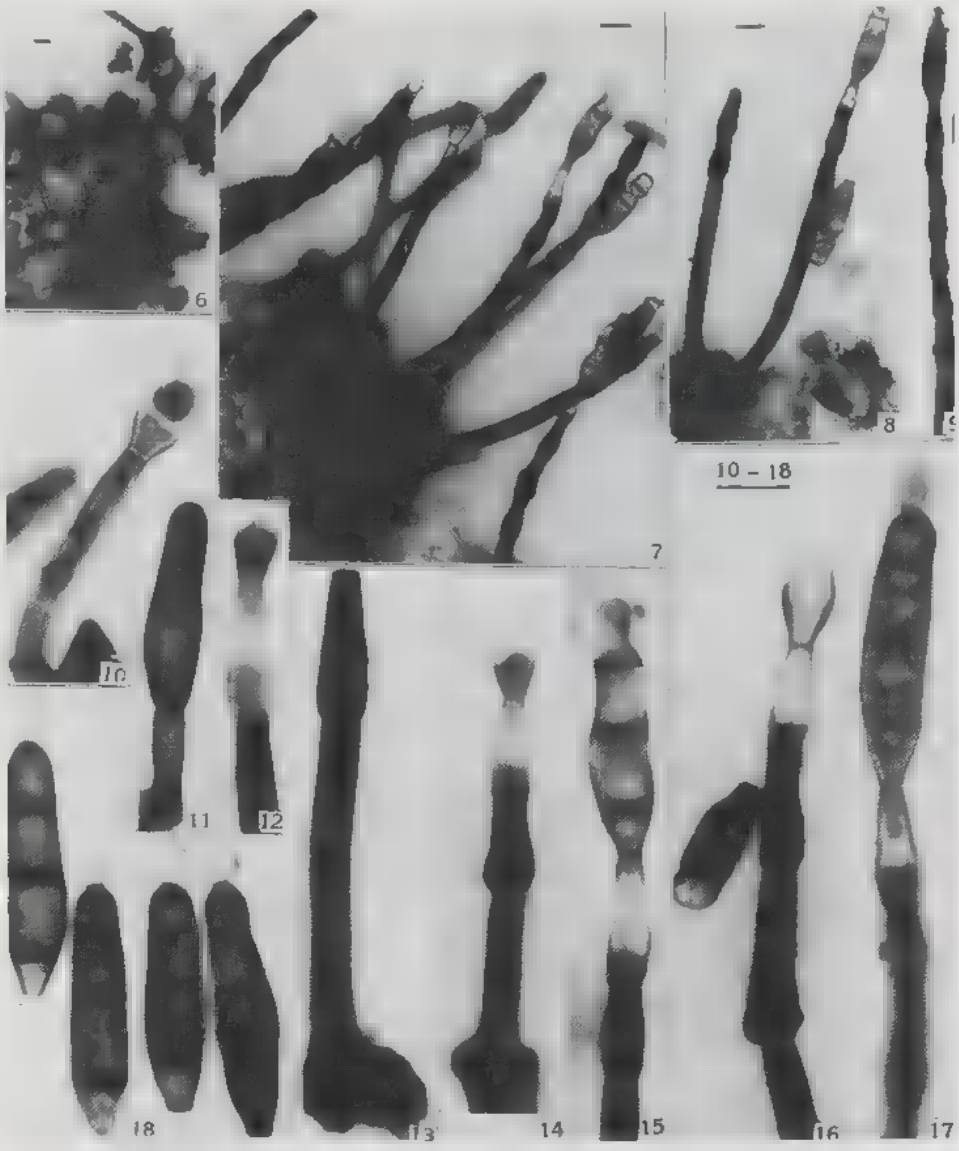

Fig. 6-18: *Javonarxia triseptata* ex Type S 118. 6: hyphae and conidiophore. Note the fungus overgrows hyphopodiate mycelium. 7-8: cluster of simple conidiophores with solitary acrogenous phragmoconidia in various stages of development . 9: conidiophore showing several lageniform proliferations and an acrogenous solitary phragmoconidium with apical cap. 10-11: stages in development of first conidium; 12-17: various stages in the development of secondary conidia subtended by characteristic lageniform cell. Note the continuity of the outer wall (layer) of conidium and subtending cell and its origin external to the dark-coloured proliferation below in figs. 12, and 14-17. Note also apical cap of mature conidium attached to conidiophore in fig. 17. Fig. 18: mature phragmoconidia. Note apical cap. Bar connotes 10μm.

Hyphomycete dematiaceae. Synnemata simplicia, undique fertilis. Cellulae conidiogenae simplicia, brevia, cylindrica vel subcylindrica, brunnea. Conidia acrogena, binatim catenata acropeta, unicellula, brunnea, sicca. Conidium prima ganglica, secunda blastica.

Species typica: Dwibeeja sundara Subramanian.

***DWIBEEJA SUNDARA* Subramanian sp. nov.**

Synnemata robust, dark-opaque, simple, fertile all over, up to 250μm tall, 28-40 (-64)μm wide. Conidiogenous cells short, cylindrical, brown, up to 20μm long, 2-5μm wide at the tip, 3-7μm wide at the base. Conidia acrogenous, typically in simple acropetal chains of two conidia on each conidiogenous cell, one-celled, coffee-brown in colour, thick-walled, smooth, dry. First conidium gangliar, fusiform, mamillate at base and at the apex, 14-21 x 6-11μm. Second conidium blastic, ovoid, mamillate at the apex, 10-15 x 7-9μm.

Type: on dead bark of *Calophyllum inophyllum* Linn. (Guttiferae), Botanical Garden, Singapore, Coll. C.V. Subramanian, 19.ii.1987 (No. S 57).

Synnemata robusta, atro-opaca, simplicia, undique fertilis, usque ad 250μm alta, 28-40 (-64)μm crassa. Cellulae conidiogenae brevia, cylindrica, brunnea, usque ad 20μm longa, 2-5μm lata ad apicem, 3-7μm lata ad basim. Conidia acrogena, binatim catenata acropeta, unicellula, brunnea, sicca. Conidium prima ganglica, fusiformia, mamillata ad basim vel apicem, 14-21 x 6-11μm. Conidia secunda blastica, ovoidea, mamillata ad apicem, 10-15 x 7-9μm.

Typus lectus in corticis emortuis Calophylli inophylli, hortus botanicus, Singapore, leg. C.V. Subramanian, 19.ii.1987, sub numero S 57.

Other collections:

1. on dead bark of *Palaquium obovatum* (Griff.) Engl. (Sapotaceae) Botanical Garden, Singapore, Coll. C.V. Subramanian (S 24), 12.ii.1987.
2. on dead bark of *Prunus polystachyus* (Hook. f.) Kalkm. (Rosaceae), McRitchie Forest, Singapore, Coll. C.V. Subramanian (S. 83), 21.iii. 1987.
3. on dead bark of *Prunus polystachyus*, McRitchie Forest, Singapore, Coll. C.V. Subramanian (S 179), 18.iii. 1987.
4. on dead bark of *Alstonia angustifolia* Wall. (Apocynaceae), Mc Ritchie Forest, Singapore, Coll. C.V. Subramanian (S 164), 18.iii.1987.

Fig. 6-18: *Javanarxia triseptata* ex type S118. 6: Hyphes et conidiophores. On notera que le champignon pousse à partir d'un mycélium à hyphopodies. 7-8: bouquet de conidiophores simples avec des phragmoconidies acrogènes solitaires à divers stades de développement. 9: conidiophores montrant plusieurs proliférations lagéniformes et une phragmoconidie solitaire, acrogène, avec une coiffe apicale. 10-11: stades de développement de la première conidie. 12-17: divers stades de développement de conidies secondaires supportées par une cellule lagéniforme caractéristique. On notera la continuité de la couche externe de la paroi de la conidie et de la cellule sous-jacente et sa position externe par rapport à la prolifération sombre située en dessous sur les figures 12 et 14-17. On notera aussi la coiffe apicale d'une conidie mûre encore attachée au conodiophore sur la fig. 17; Fig. 18: phragmoconidie mûre avec coiffe apicale. Echelle = 10μm.

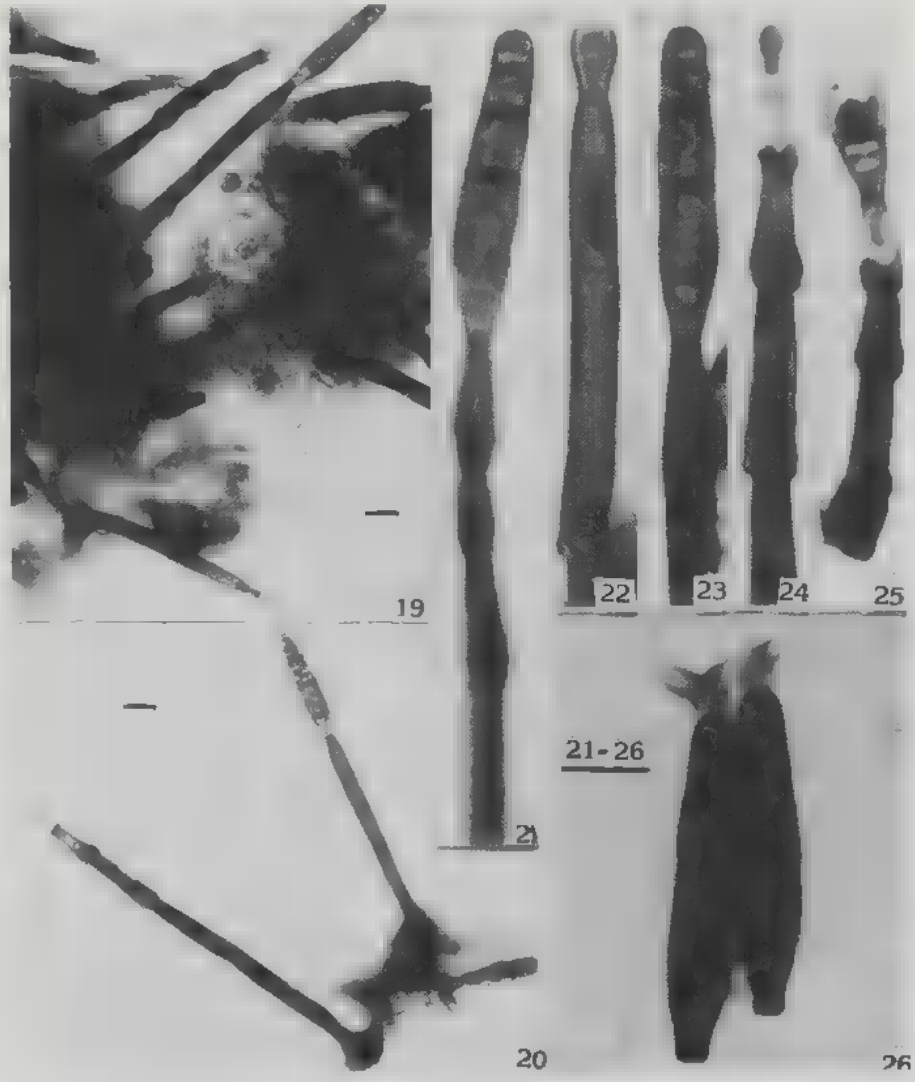

Fig. 19-26: *Javonarxia quadriseptata* ex type S 120d. 19-20: general view of mycelium, conidiophores and conidia. Note in fig. 20 conidiophore on the right with the first conidium still attached and the conidiophore on the left with 3 proliferations and a conidium with a subtending lageniform cell developing apically. 21: part of conidiophore with 3 proliferations and a mature phragmoconidium still attached. 22: early stage in development of first conidium. 23: mature first conidium with cap, still attached to conidiophore. 24, 25: stages in development of conidia on conidiophore with 2 and 1 proliferations, respectively. 26: two conidia showing emergence of germ tubes ex the apical cap of the conidium. Bar connotes 10μm.

Fig. 19-26: *Javonarxia quadriseptata* ex type S120d. 19-20: vue générale des mycélium, conidiophores et conidies. On notera sur la figure 20, à droite, un conidiophore avec la première conidie encore attachée, à gauche un conidiophore avec trois proliférations et une conidie avec cellule sous-jacente lagéniforme. 21: partie du conidiophore avec trois proliférations, une phragmoconidie mûre encore attachée. 22: stade précoce de développement d'une première conidie. 23: première conidie mûre avec coiffe, encore attachée au conidiophore. 24-25: développement de conidies sur conidiophores avec respectivement 2 et 1 proliférations. 26: conidies montrant la sortie d'un tube germinatif à partir de la coiffe apicale. Echelle: 10 μm.

2. *JAVONARXIA TRISEPTATA* gen. et sp. nov. and 3. *J. QUADRISEPTATA* sp. nov.

Two interesting hyphomycetes, distinct, but clearly congeneric, were collected from Malaysia, both peculiarly on twigs of *Smilax* sp. and are described below.

The first of these is based on a collection on twigs of *Smilax* sp., from Cameroon Highlands (S 118). The fungus is apparently hyper-parasitic or overgrows epiphytic hyphopodiate mycelium of other fungi on the substrate (Fig. 6). The fungus is easily recognized by its conspicuous conidiophores: these are erect, mostly straight, simple, cylindrical, thick-walled, dark brown, septate, each sometimes arising from a flattened radially lobed basal cell or foot 15-18μm across and 7.0-12.0μm in height, single in clusters of a few, or conspicuously caespitose, up to 200μm tall, and 4.5-6.0μm wide at the base (Fig. 7 to 9). The conidia are acrogenous, gangliar, solitary, dry, brown, somewhat obclavate, narrowing at the base to a flattened scar 2-3μm wide, widest midway in the lower half, typically 3-euseptate, often with the two median cells larger and longer than the end cells, smooth-walled, each with a smoothly rounded hyaline to subhyaline apical cap about 4.5-7.5μm long. The conidia are 28-36 x 6-9μm (Fig. 10-11).

Conidium ontogeny in this fungus seems to be unique (Fig. 12 to 17). After the first conidium which develops terminally on the apical cell is shed, the conidiogenous cell proliferates (percurrently) to produce a conidium subtended by a characteristically lageniform basal cell, a process that is repeated almost indefinitely so that a conidiophore may have several such lageniform conidium-subtending cells in a linear series, depending on the number of successive conidia so produced at higher and higher levels. When mature, the proliferations become dark-coloured and thick walled. Early stages in development of these apparent percurrent proliferations show clearly the hyaline or subhyaline wall of the conidium and subtending lageniform cell to be continuous with and external to the subtending lageniform proliferation - clearly not enteroblastic (Fig. 12, 14 and 17). Each conidium initial apparently has a layered wall: the outer hyaline or subhyaline layer gets broken early and the upper part of the broken wall presumably remains as a cap (Fig. 17). Ultrastructural study would help a better understanding of the finer details of conidiogenesis and genesis of the characteristic conidial cap.

The second fungus was also collected on *Smilax* sp. from Cameroon Highlands (S 120d) and is basically similar to the first one, but yet distinct. The conidiophores arise from repent hyphae and are small, robust, erect, straight or bent, subcylindrical, brown, thick-walled, septate, 80-180μm tall, 7.5-10.5μm wide, slightly narrowed at the tip, (percurrently) proliferating on secession of the successively produced solitary conidia (Fig. 19-20). The conidia are gangliar, acrogenous, solitary, brown, obclavate-fusiform to fusiform, widest midway in the lower half, truncate at the base, smooth-walled, smoothly rounded at the tip, 4-septate, the second cell from the base usually the longest, followed by the cell immediately above, the apical cell the shortest and usually the smallest, each with an apical cap, 45-51 x 7-11μm, 4.5-6.0μm wide at the truncate base. Following secession of the first conidium which develops at the apex of the conidiophore, the conidiophore proliferates terminally to give rise to a characteristically lageniform proliferation and a conidium initial at the tip of the proliferation (Fig. 21-25). The second conidium, when mature, is disloged at the junction between the tip of the lageniform cell and the conidium itself. The process is repeated. Conidiogenesis is closely similar to what has been seen in S 118. The

lageniform proliferations become thick-walled and dark-coloured when mature and are 15-32 x 7-9μm. One or two what appear to be rare cases of germ tube emergence (? germination) from the apical cap of conidia have been seen (Fig. 26).

This fungus has more robust conidiophores, longer lageniform proliferations and larger conidia that are 4-septate instead of being 3-septate compared to the first one. The two fungi are obviously congeneric.

The simple, dark, erect conidiophores with lageniform percurrent proliferations and the brown, gangliar phragmoconidia are reminiscent of *Sporidesmium nodipes* (Penz. & Sacc.) Hughes and a few other species of *Sporidesmium* that have similar conidiophores. These have been redisposed by Subramanian (1991) in a separate genus, *Penzigomyces*. Nevertheless, the ever-present conidial cap in the two fungi described here is unique and has not been observed by the author in the type and other specimens of *Sporidesmium nodipes* which he has examined; they are not seen even in the author's fresh collections of this taxon from S.E. Asia. Apparently, there is no genus known in which the two fungi from Cameroon Highlands can be accomodated satisfactorily. A new genus *Javonarxia* is proposed here to take them. The generic name is in honour of my good and long-time friend, the late Dr. J.A. von Arx, former Director, CBS, Baarn, the Netherlands, and commemorates both his contributions to science and his humanity.

JAVONARXIA **Subramanian anamorph gen. nov.**

Dematiaceous hyphomycete producing gangliar conidia. Conidiophores simple, erect, brown, septate, with a succession of lageniform 'percurrent' proliferations. Conidia acrogenous on conidiophore and successive proliferations, solitary, obclavate, fusiform, or fusiform-obclavate, euseptate, truncate at base, rounded at apex, with an apical cap.

Hyphomycete dematiacea conidia ganglica producentes. Conidiophora non ramosa, erecta, fusca, septata, cum proliferationes successivae terminales lageniformes percurrens. Conidia acrogena ad apicem conidiophororum et proliferationem successivum, solitaria, obclavata, fusiformia, vel fusiformia-obclavata, euseptata, truncata ad basim, rotundata ad apicem, cum pileatus apicali.

Species typica: Javonarxia triseptata Subramanian sp. nov.

JAVONARXIA TRISEPTATA **Subramanian sp. nov.**

Mycelium superficial, hyperparasitic or overgrowing epiphytic hyphopodiate mycelium. Conidiophores erect, simple, cylindrical, thick-walled, dark brown, septate, single, gregarious or caespitose, up to 20μm tall, 4.5-6.0μm wide. Conidia acrogenous, gangliar, solitary, brown, dry, obclavate, widest midway in the lower half, narrowing towards the base to a flattened scar 2-3μm wide, typically 3-euseptate, often with the two median cells larger and longer than the end cells, smooth, smoothly rounded at the apex, 23-36 x 6-9μm, and with a hyaline to subhyaline apical cap about 4.5-7.5μm long.

Type: on twigs of *Smilax* sp. (Liliaceae), Cameroon Highlands 17.v.1987, Coll. C.V. Subramanian (S 118).

Mycelium superficiali, hyperparasitici, vel superorti mycelium epiphytis hyphopodiatis. Conidiophora erecta, simplicia, cylindrica, crassitunicata, atro-fusca, septata, solitaria vel gregaria vel caespitosa, usque ad 20μm alta, 4.5-6.0μm lata. Conidia acrogena, ganglica, solitaria, fusca, sicca, obclavata, latissima ad

media dimidio inferiore, angustata et truncata et 2-3μm lata ad basim, 3-eusepta-ta, levia, rotundata ad apicem, 28-36 x 6-9μm, et cum pileatus apicali vel 4.5-7.5μm longi.

Typus lectus caulibus Smilacis sp. (Liliaceae), Cameroon Highlands, Malaysia, 7.v.1987, leg. C.V. Subramanian, sub numero S 118.

***JAVONARXIA QUADRISEPTATA* Subramanian sp. nov.**

Mycelium superficial, composed of subhyaline to brown, septate hyphae. Conidiophores simple, robust, erect, straight or bent, subcylindrical, brown, thick-walled, septate, 80-180μm tall, 7.5-10.5μm wide, proliferating successively on secession of the successively produced solitary conidia. Conidia acrogenous, solitary, gangliar, brown, obclavate-fusiform to fusiform, widest midway in the lower half, truncate at the base, smooth-walled, smoothly rounded at the tip, 4-septate, the second cell from the base usually the longest, followed by the cell immediately above, the apical cell the shortest and usually the smallest, each with an apical cap, 45-51 x 7-11μm, 4.5-6.0μm wide at the truncate base. Lageniform proliferations thick-walled, dark coloured when mature, 15-32 x 7-9μm.

Type: on twigs of *Smilax* sp. (Liliaceae) Cameroon Highlands, Malaysia, 7.v.1987, Coll. C.V. Subramanian, No. S 120d.

Mycelium superficiale ex hyphis subhyalinis vel fuscis, septatis compositum. Conidiophora simplicia, robusta, erecta, recta vel flexa, subcylindrica, fusca, crassitunicata, septata, 80-180μm alta, 7.5-10.5μm lata, proliferata subinde post secernens conidiae successivae productae. Conidia acrogena, solitaria, gangli-ca, fusca, obclavato-fusiformia, vel fusiformia, latissima ad median in dimidio in-feriore, truncata ad basim, levia, rotundata ad apicem, 4-septata, 45-51 x 7-11μm, 4.5-6.0μm lata ad basim, cum pileatus apicalis. Proliferationes lageni-formis crassitunicatis, atris, 15-32 X 7-9μm.

Typus lectus in caulibus Smilacis sp. (Liliaceae), Cameroon Highlands, Malaysia, 7.v.1987, leg. C.V. Subramanian sub numero S 120d.

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